

L. to r.: Roundtable participants Khaled Abubakr, Frank Mastiaux and Ambassador Richard Jones at the entrance to the Emirates Palace Hotel in Abu Dhabi, which hosted the event.

## Optimizing the Energy Mix

On the sidelines of the 2010 World Future Energy Summit in Abu Dhabi, United Arab Emirates, *Living Energy* gathered a distinguished international group of experts with diverse backgrounds in various aspects of the energy field for a roundtable discussion on optimization of the energy mix today and in the future. Their insights into four key issues surrounding this topic formed the basis for this article.

By Ward Pincus

One of the most strategic issues facing any country is the challenge of securing access to energy resources that are sufficient to run its economy, feed and house its people, and protect its borders. With major change coming in the form of a growing role for renewable energy and increasing international concern about global warming, governments, policy makers, citizens and companies are reexamining the question of the right mix of energy resources, and what factors should play a de-

termining role concerning that mix. In fact, the share of renewable energy in the global energy mix is expected to rise from 3 percent today to 17 percent in 2030. With nuclear accounting for another 15 percent, hydrocarbons will nevertheless remain the backbone of energy generation for the foreseeable future.

In the following excerpts from the roundtable discussion held in Abu Dhabi, Ambassador Richard H. Jones, Deputy Executive Director of the International Energy Agency (IEA); Frank Mastiaux, CEO, E.ON Climate & Renewables; Khaled Abubakr, CEO of TAQA Arabia, and Anders Wijkman, Vice President of the Club of Rome, offer their opinions and expertise on many of the key aspects of the energy mix optimization debate. In addition to the comments recorded here, there was a consensus among the four roundtable participants that security of supply, sustainability of supply, and affordability of supply are the

three main criteria governing optimization of the energy mix. They also noted that the relative importance of these three factors will vary by region and country. And they variously observed that an increasing role for renewables is driven not only by concerns about climate change, but also by security of supply and as a development tool for some of the more than 1.5 billion people who today have no access to electricity.

In addition, there was agreement among the participants that government policy plays a crucial role in moving the renewable energy industry forward, given that with existing technology, renewable power is generally more expensive than conventional fossil fuels. However, they emphasized, that policy must be dynamic and flexible enough to evolve as the technologies mature in order to ensure that resources continue to be used efficiently and send the right signals to the private sector.



Photos: Tina Heger/Agentur Focus, private

Anders Wijkman, the fourth roundtable participant, joined the energy mix discussion remotely from his home country of Sweden.



The rear exterior of the Emirates Palace Hotel. Siemens provided the medium-voltage switchgear technology for the impressive traditional structure.

### Is an energy mix with 100 percent renewable sources the goal to which we all should strive?

MASTIAUX: As long as we don't have the technical capability for the delivery of renewable power 100 percent of the time, you have to have a backup. This is exactly the point of a transition period that will take us from fossil fuels to renewables, but it will take some time to get to this end game.

JONES: At the IEA, we look at three criteria for judging sound energy policy: We look at the energy security issue, in that the sources of energy should be as secure as possible; we look at the economic component, in that it should be affordable; and we look at the environmental aspect, in that it should be sustainable. Renewables do well on environment and do pretty well on security. However, there is an issue of security with renewables as well, since renewable power plants are made of materials, some of which are in short supply, such as rare earths, for example. As for economics, at some point re-

newables probably will be more affordable, but that could be a long way off.

ABUBAKR: I would add that these three elements are weighted differently from one region to another and from one country to another, depending on the priorities of each country. Some countries, such as those still dealing with high levels of poverty, have other priorities, such as education and health care, that will come before environmental issues.

WIJKMAN: From a long-term perspective, a world where renewables are the major source of energy is not just a utopian dream, but rather something that must happen, because the side effects of the fossil fuels we primarily use today are so substantial – not only in terms of climate change, but also issues like health and security of supply. I agree that the economic argument is important, but we have to bear in mind that most external effects linked to the use of fossil fuels are not a part of the market price. So I don't think

we can compare solar with coal without taking into account externalities. If we properly account for them, I imagine many renewable technologies in use today would be cost-effective. We have to look at cost in a wider context than market prices, because market prices don't tell the truth today.

**Addendum:** All of the roundtable participants generally acknowledged that too many governments today are subsidizing fossil fuel use, rather than trying to reduce it. However, more than once, it was noted that until renewable energy can carry the base load, hydrocarbons will remain the dominant component of the energy mix, and as such, it's important to continue significant research into, and implementation of, technologies that make fossil fuel energy generation increasingly efficient and clean. Separately, it was pointed out that sustainability of the entire energy system, rather than individual parts, should be the focus, so that if an energy mix is sustainable overall, it shouldn't matter if it includes fossil fuels.

### How then do governments, policy makers and the private sector impact the energy mix?

ABUBAKR: While climate change is important in the long term for our nation and our children's future, as a company and a country, we are not going to switch to renewable energy for the beauty of green. Rather, given that oil and natural gas supplies will not be enough to meet our future energy needs, Egypt and neighbors such as Jordan and Syria are looking to alternative energy as a fundamental and essential part of the energy mix.

WIJKMAN: In the European Union context, we have been quite successful in providing specific incentives in wind, solar, efficient biomass, etc., which has supplemented cap and trade, whose CO<sub>2</sub> penalty is too low. These incentives, including feed-in tariffs, have led to quite dramatic increases in wind and solar energy production across Europe. This combination of a carbon tax and fees, and some specific incentives for renewables, is the ideal policy mix.

JONES: When designing subsidy and other support programs, you must keep in mind that tremendous inefficiencies can result if you just throw money at something. As long as resources are limited, you have to be careful how you use them. Particularly in developing countries where there are greater constraints on those resources, you have to be very careful in how you choose your support programs. Blanket subsidies can result in a misallocation of resources, so you need to think about the whole system, including externalities and all your competing demands. In the end, deciding your energy mix is all about quality of life for the people in your country. That's why you want whatever system you use to be as efficient as possible.

MASTIAUX: In a world of constrained resources, misallocation can become a problem. The heart of the matter is in fact very simple. Renewables have to beat coal in cost. That implies that either you make coal more expensive, i.e., impose a carbon price for a while, or make renewable technology much more competitive – and that is where very careful handling of the right incentive mechanisms is crucial. There is a good case for a blanket feed-in tariff to kick-start development to encourage investment. But then there is a tipping point to watch for very carefully, where you have to manage your subsidies toward a more market-related mechanism. Maybe in five or six years, you will have enabled enough

advancement that you are moving closer in some parts of the world to having wind and solar at grid parity.

JONES: You need to have flexibility in your policies, so that they change over time, as the technology matures and becomes more commercial. Once you've achieved grid parity, there's no need to subsidize a given technology any more, and then you can move to supporting the development of another technology.

MASTIAUX: However, the one thing that governments must not do is retroactively change their promises regarding incentives – otherwise, people will never come back to invest.

WIJKMAN: It's clear that developing countries have lots of needs, like health care and education, so they can't spend all their investments on energy. That's why I think it's fair that developed countries – who built their industrialization on cheap oil – should give a helping hand to developing countries, whether in helping to fund mitigation schemes and subsidies such as feed-in tariffs, or through shouldering the burden of investment in green tech.

**Addendum:** The participants also commented that energy security concerns might encourage countries to pursue renewable energy, even if it weren't the optimal choice from an economic perspective, in order to



Living Energy journalist Ward Pincus moderated a lively discussion among the energy experts.

Photos: Susanne Nips, Tina Hager/Agentur Focus

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Photos: Tina Hager/Agentur Focus, private



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diversify the country's power supply and weaken a supplier's ability to dictate price.

All agreed that demand-side reduction should be a part of the energy mix optimization discussion, with Ambassador Jones noting that demand reduction technologies often are cheaper to implement than renewable generation technologies and can cut consumption by larger amounts. Wijkman cautioned, however, that there is a tendency for money saved on energy efficiency in one sector to be spent on energy in another sector, and suggested that this should be monitored.

#### On its own, can the private sector push development of renewable energy?

ABUBAKR: There are certainly limits regarding the scale to which the private sector can go.

MASTIAUX: An increasingly stressful element of the conversation will be about resource availability, in terms of financing and people. If you take up the value of committed, quasi-committed and intended renewable power projects, and add to this the planned conventional power plants, that's a big number. Then add up the balance sheets of the few big companies that can do these kinds of projects and you see a huge mismatch.

ABUBAKR: Our host here, Siemens, and others from Europe are conducting a variety of studies and are making investments – all with no secure guarantee of a return – to develop renewable energy outside of Europe, thereby helping to diversify sources of energy supply. This is healthy for the Middle East and North Africa region, because it breaks the status quo on fossil fuels.

WIJKMAN: It is encouraging to see that plans regarding concentrated solar power plants being set up in North Africa with transmission to Europe are not only being talked about, but are being looked into by leading play-

ers such as E.ON and Siemens. If that could happen, it could change the game quite dramatically.

Based on the European experience, what really made the market in renewables explode was finally deciding to set binding targets for member states. This provides a sort of guarantee that development will move in a certain direction, so that those who invest in the industry have a guarantee that governments will make it happen.

ABUBAKR: If you look to a number of African countries, the political stability is just not there; you need stability to support such large-scale projects. To do long-term planning by the government, you need a strong and stable government. Renewable energy requires government will, government stability and long-term policies. If those are not there, you'll just be speaking theoretically about renewable energy in these countries.

#### Is there some unforeseen technology change or other event that would dramatically alter energy mix optimization in the future?

MASTIAUX: What we have not fully appreciated yet is the unforeseeable behavior component of how energy is dealt with by consumers. Why do we think people in developing countries will follow the same stepladder that we have known for 100 years in OECD countries? Look at phone technology: People thought that if China and India go into phones for everyone, there must be lines, but that didn't happen. They stepped past that stage and moved to mobile technology.

WIJKMAN: The whole issue of leapfrogging is key. If it's possible in IT, it's possible in energy. If we provide some financial mechanism to help renewables become a major source of energy in developing countries, leapfrogging might be more of a reality.

JONES: However, we must bear in mind the existing capital stock, which is durable and often has a very low

cost of operation. Renewables are taking a significant portion of the new incremental demand, but they are not replacing the base because you have such tremendous investments in fossil-fuel-fired plants. That's one reason why the IEA is promoting carbon capture and sequestration. It's not because we want to encourage construction of new plants, but because we understand that there are a lot of fossil fuel plants out there that will be generating energy for a long time. Given that, carbon capture and sequestration is a way to make these plants much cleaner. It doesn't matter that we introduce new technology and witness leapfrogging, because the people who own those conventional plants are making a profit with them and can continue to make a profit – in some cases even if they have to pay a carbon price.

WIJKMAN: I'm not talking about investments already made, but about investments yet to come. Some two billion people depend entirely on fuelwood and dung for their energy supply. To help bring them out of poverty, they need access to modern energy sources, and renewable technologies should be looked into as part of their development – as part of the poverty eradication agenda. For these people, it's not primarily a climate change issue.

JONES: One of best ways to move them onto the grid is through renewables – both because of the employment aspect, and because renewables allow distributed generation, so you don't have to invest a lot in transmission lines. That's a way to leapfrog – just drop the power station in, and it runs off of wind power or solar power. It's a way to get a lot of people access to electricity.

**Addendum:** The experts also emphasized that another important aspect of the energy discussion concerns smart grids. Not only can smart grids send messages to appliances regarding peak tariffs in order to have appliances reduce their energy consumption during those peak load periods, but grids



#### Ambassador Richard H. Jones, Deputy Executive Director of the International Energy Agency, Paris, France

Ambassador Richard Jones is Deputy Executive Director of the International Energy Agency. He is a former American diplomat with extensive energy policy experience gained from 30 years in the diplomatic corps, including ambassadorial postings in the Middle East and Central Asia. Born in the United States, Ambassador Jones has a BS in mathematics, and an MSc and PhD in business/statistics.



#### Frank Mastiaux, Chief Executive Officer, E.ON Climate & Renewables, Düsseldorf, Germany

Frank Mastiaux is CEO of E.ON Climate & Renewables. He has more than 15 years' experience in the energy industry, including executive positions in the UK, the USA and Germany. Prior to his current role, he was the CEO of BP's global liquefied petroleum gas business. Mastiaux was born in Germany and holds a PhD in chemistry.



#### Khaled Abubakr, Chief Executive Officer, TAQA Arabia, Cairo, Egypt

Khaled Abubakr is Chief Executive Officer of TAQA Arabia, a Cairo-based full-service energy solutions group operating in the Middle East and North Africa. Abubakr has worked in the Middle East energy sector for more than 25 years, participating in the development of the Egyptian gas industry, in both public- and private-sector roles. Born in Egypt, Abubakr holds a BSc in mechanical engineering.



#### Anders Wijkman, Vice President, Club of Rome, Winterthur, Switzerland

Anders Wijkman is Vice President of the Club of Rome, a non-profit NGO and global think tank, and Vice Chairman of the Tällberg Foundation. Wijkman, who has more than 30 years of experience in social, development and environmental policy, was until last year a Member of the European Parliament, where he was on the Environment, Development Cooperation and Climate Change committees. Born in Sweden, Wijkman holds a BA in economics and political science.

Photos: Tina Heger/Agentur Focus, private

in the future also will be able to receive power from a variety of sources across the grid, as well as deal with intermittent power supply into the grid. While the conversation among the roundtable participants certainly exposed some differences of opinion, what was unexpected was the general consensus that, while acknowledging the dominant role of hydrocarbons for the foreseeable future, renewables

will represent an increasing share of the energy mix going forward and that this might happen faster and on a more significant scale than generally expected. What's more, there was complete agreement that the energy mix in the future will be heavily influenced by the interplay between government and the private sector regarding the support for renewables in each economy.

## Glossary

- **Carbon Credits:** These are certificates created when a company reduces its carbon emissions below its assigned cap. The owner can trade these credits on markets created to set prices and facilitate trading in these credits. Credits can be bought by companies who have exceeded their carbon caps, by investors betting that their price will increase, or by those seeking to take them off the market as a way to drive up prices and make exceeding carbon caps more expensive.
- **Demand-Side Reduction:** Refers to the reduction in electricity demand as a result of policies, technologies or consumption patterns that require less power than otherwise would be the case.
- **Feed-in Tariffs (FITs):** An incentive that provides a guaranteed price for a fixed period of time to entities generating electricity using renewable technologies and feeding that electricity into the grid. By providing such a guarantee, FITs encourage investors to make the (often large) financial commitments necessary to build such plants.
- **Grid Parity:** A term that refers to the point when renewable power technologies produce electricity at the same (or lower) cost than the cost of generating electricity by burning fossil fuels.

For further glossary terms see: [www.siemens.com/glossary](http://www.siemens.com/glossary)

*Ward Pincus, a freelance writer based in Dubai, has written on science, technology, health and business issues for publications in North America, Europe and the Middle East. He is a former correspondent for the Associated Press (AP) in the UAE.*

## Further Information

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